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Guidelines for Snow Disposal and Deicing Operations in Ontario

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Introduction

The guidelines for snow disposal and deicing operations were developed for the Ontario Ministry of the Environment by the Task Force on Snow Disposal, established in 1972 and comprised of representatives from the cities of Barrie, London, Ottawa and Toronto; the Municipality of Metropolitan Toronto, Environment Canada; the Ontario Ministry of Transportation and Communications and the Ontario Ministry of the Environment.

Under the direction of the Task Force, snow quality studies were conducted in municipalities throughout Ontario during the winters of 1972-73 and 1973-74. A questionnaire on snow disposal and deicing practices was distributed to every city and town in Ontario; and, an intensive literature review was conducted by the Ministry of the Environment. The findings of these projects along with the expert advice of Task Force members and the agencies they represent have been incorporated into the following guidelines.

Background

The Ontario Ministry of the Environment is concerned over the potential water pollution threats inherent in the practice of snow disposal and other winter road maintenance operations. Through studies conducted over the past two winters from the Technical Task Force on Snow Disposal, it has become evident that snow falling on municipal roadways accumulates contaminants such as oxygen demanding organic material; oil; dissolved salts, notably chlorides; heavy metals such as lead; particulate matter such as clay sand; detritus; litter and often domestic garbage.

Improper disposal of this contaminated snow may create a risk of environmental pollution. Direct disposal of contaminant laden snow into lakes or watercourses can create degraded water quality conditions by blanketing the river or lake bed with settleable solids, drawing down dissolved oxygen levels, introducing toxic materials such as lead, substantially increasing the levels of dissolved salts such as chlorides and generally creating aesthetically unacceptable conditions through the introduction of refuse.

Similarly, indiscriminate disposal of such snow on land may create a visually unattractive land site as well as a potential risk to public health from decomposing organic trash, heavy metal contamination of surface soils and possibly, the percolation of dissolved materials to a ground water aquifer. Poorly chosen sites may create problems to surrounding land owners from melt water runoff and noise of operation.

Snow and ice control through the application of sodium chloride (rock salt) also creates a potential for contamination of rivers and lakes by increasing the chloride concentration. Since the turn of the century, the chloride level in Lake Ontario, for example, has shown a threefold increase from about 9 to 29mg/l. A study by the Ontario Ministry of the Environment shows that, while industrial sources account for over half the net chloride input to Lake Ontario, deicing salt, followed by tributary loading and sewage treatment plan discharges, contribute significantly to the chloride input to the lake. The chloride loading from deicing salt is unique in comparison to the other sources in that it can be controlled without costly treatment processes by limiting salt application.

In the past few years, many authorities responsible for street and highway maintenance have voluntarily limited the amount of salt applied, whenever possible, to reduce the pollutant effect of chloride on the environment. Also the potential for surface and ground water contamination from salt stockpile leachate has been recognized and many stockpiles operated by the Ministry of Transportation have been enclosed or waterproofed.

In the following sections, guidelines to minimize the environmental impact of snow collection and disposal practices and deicing operations are presented.

Snow Disposal Guidelines

1. Collection

Studies have shown that the level of contaminants in snow is related to traffic density. For environmental concerns and practical reasons (i.e. traffic flow), snow from heavily travelled roadways should be removed as quickly as possible following a storm.

A portion of the contaminant load of snow collected from municipal roadways may be attributed to garbage, trash, and other refuse inadvertently picked up in the snow collection operation. Efforts should by made to minimize the chance of picking up refuse as part of the snow removal operations by such means as coordinating garbage collection and snow clearing operations, and public education.

2. Disposal

(a) Direct Disposal

Direct disposal of snow to watercourses should be eliminated wherever possible, as should the disposal of snow on ice-covered lakes and rivers. Certain conditions may arise where direct dumping may be the only practical alternative. Approval is required from the Regional Manager, Technical Support, Ministry of the Environment prior to the commencement of such an operation.

The Ministry advises municipalities to fully evaluate all alternatives to direct disposal before making application. Disposal on an approved land site is considered in most cases the best solution, but if land sites are limited or unavailable, we urge that mechanical melters used in

conjunction with a settling chamber or other innovative disposal and treatment systems be evaluated before reverting to direct disposal.

In considering applications for direct disposal, it should be recognized that snow can be highly variable in quality. As a general rule, the Ontario Ministry of the Environment recommends that snow collected from heavily travelled arterial routes be disposed of on land. If land sites are limited, fresh fall collected from low traffic density roads and parking lots may be approved for direct disposal.

(b) Mechanical Melters

Mechanical snow melters are being considered or employed in several municipalities. Stationary melters should be designed to incorporate sedimentation chambers which will remove the settleable and floating materials prior to discharge to the municipal sewer system. Sufficient studies have not been conducted on the effectiveness of solids removal in mobile melters. Future studies may indicate that settling chambers or other treatment mechanisms will have to be built into these units as well.

In the case of snow melter discharge to a sanitary sewer, the impact of this loading on the municipal sewage treatment works should be assessed before proceeding with this alternative.

Solids collected in mechanical snow melter units should be disposed of in approved sanitary landfill sites.

(c) Disposal of Snow on Land

Generally, snow disposal on land is considered the most preferable method of handling this waste. With proper site selection and operation, the following objectives can be met:

1. Refuse collected with snow is retained and can be collected and properly disposed of after the thaw.
2. Particulate solid inputs to a watercourse can be reduced or eliminated.
3. Other contaminants, such as heavy metals and phosphorus may be reduced by mechanisms such as ion exchange and absorption (depending upon the soil characteristics of the site).
4. While most soluble salts will ultimately reach surface or ground waters in the vicinity of the disposal site, the rate of discharge may be averaged out over time, avoiding a concentrated input as is experienced with direct disposal.
5. Oxygen demanding loadings can be largely reduced or eliminated by the retention of organic particulate matter at the site or BOD satisfaction in surface drainage toward the watercourse.

Land Site Criteria

Land disposal sites must be accessible, large enough to contain the projected maximum snow load that might be disposed there in any one season, yet be close enough to the district where the bulk of the snow is collected to be economically practical. Access to the site should be

limited and adequately policed by the municipality to ensure that only snow is dumped in the area.

In evaluating the relative suitability of sites which meet these basic conditions, the following criteria should be considered:

1. Accessibility - Snow disposal areas should be selected so that access roads and the site itself can bear heavy truck traffic when the ground is not frozen in case of late-autumn or spring snowfalls requiring plowing and hauling.
2. Noise - Snow hauling and dumping operations can produce an objectionable noise level, particularly as they are commonly undertaken at night. A basic criterion is that any dumpsite and road access to and from the site should not be in a location where noise of the operation will be objectionable to nearby residents. Richards & Associates[1] suggest that a dumpsite on level ground should be at least 1,000 feet from a residential area. A site in a hollow or other location where natural or man-made barriers will baffle the sound may be located closer to residences without creating a nuisance. The snow pile itself can be situated in such a way as to create a sound barrier.
3. Alternate Use of the Site - Because of contaminant loading of the soil, use of the snow disposal site for other purposes may be restricted unless remedial measures are taken. The procedures and cost of eventual rehabilitation of a snow disposal site should be considered before its establishment. A municipality may consider setting aside the approved location as a permanent snow disposal site. Such a site should be permanently fenced. Alternately, the contaminated soil layer might be stripped and replace to permit other uses of the land.
4. Visual Considerations - The site should be screened and/or physically buffered from public view as snow piles are usually unsightly, particularly during snow melt.
5. Drainage Factors - A site which appears suitable for snow disposal based on the above criteria should be carefully evaluated for drainage characteristics. The following are basic surface drainage criteria:

    - The site should preferably be remote from surface watercourses. The construction of berms and dykes may be required to prevent direct drainage to a watercourse. No guidelines can be laid down on the distances required, which well be dependent on land slope, soil permeability, and the extent of dyking which is practicable and economical. As an example, it is considered that with average land slopes of less than 3% in permeable soils, a site location with a runoff distance to a watercourse of more that 600 feet would be acceptable without dyking, or with a minimum of dyking.
    - The quantity of snow which can be stock-piled at a particular site should be assessed in relation to estimated runoff rates and quality, the dilution capacity of the watercourse to which the melt will discharge, and downstream water uses. Consideration must also be given, of course, to the period required for melt, and for ground drying if use of the site in summer is contemplated.

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[1] J.L. Richards & Associates. *Snow Disposal Study for the National Capital Area*, 1973.

- Care should be taken in site selection that deposited snow will not seriously obstruct natural drainage patterns, and that drainage from the site will not adversely affect adjoining property.

6. Sub-surface Drainage - Use of ground water immediately down-gradient of a possible site should be determined as part of the site evaluation process. Hydrogeologic investigations should be conducted to determine the potential for ground water pollution from contaminants in the snow. Wherever possible, land disposal sites should be located in areas where an impervious strata with prevent the migration of soluble contaminants to the ground water aquifer of in areas of ground water outflow. Recharge areas may be suitable if, in the opinion of the hydrologist, the aquifer supplying potable water is not liable to be impaired.

Municipal sanitary landfill sites should not be used for snow disposal because the addition of moisture may significantly accelerate the movement and increase the volume of leachate production with a concomitant increase in gas production in the landfill.

A site which does not fully meet the criteria outlined above may be approved if disposal to this area will result in the least adverse environmental impact of all methods available. All snow disposal sites should be evaluated by the Ontario Ministry of the Environment. Contact the Regional Office.

Deicing Chemicals

The Ministry of the Environment recognizes that the use of deicing chemicals is an essential operation in Ontario to facilitate the movement of vehicular traffic and protect the public safety during adverse winter road conditions. Few chemicals other that sodium chloride (rock salt) and , to a lesser extent, calcium chloride appear economically feasible for widespread use a deicers. However, road maintenance authorities are advised that certain chemical substances such as nitrates and phosphates (for example, urea) and organic substances such as methanol, alcohol, or ethylene glycol present particular hazards to the aquatic environment and should not be used in bulk as deicers except in special circumstances (eg. airport runways, airplane fuselage deicers, etc.) with appropriate control facilities. The Regional Office of the Ministry of the Environment should be consulted prior to application of such deicers by municipalities or commercial users.

Similarly, certain rock salt additives are environmentally hazardous. Rust inhibitors (eg. hexavelant chromium) can impair water quality and should not be used. Ferric ferrocyanide, commonly added as an anti-caking agent, has not proven hazardous in the small quantities found in road salt.

1. Deicing Salt - Application Guidelines

One of the immediate concerns of the Ministry in this matter is that the amount of chloride introduced to the environment from deicing operations be kept to a minimum. The Ministry promotes the sensible and conservative use of road salt and concur with the following operational guidelines, which have been designed after practices in a number of Ontario municipalities.

(a) Reduce salt application rates to the minimum amount necessary to successfully do the job. Experience has shown that an application rate in the order of 400-500 pounds per 2-lane mile is usually sufficient. If the desired effects can be achieved with less salt then these lower rates should be applied.
(b) Employ rate controlled salt distribution equipment which operates independently of the vehicle's speed.
(c) Salt only main thoroughfares and critical sections of other roadways, such as inclines, intersections, crosswalks, etc.
(d) Where salt and sand mixtures are applied (usually in northern municipalities and on rural roads) incorporate into the admixture only enough salt to achieve the desired results.

Much of the snowfall and contaminant loading on roadways eventually reaches the storm sewer system and ultimately gains access to a watercourse. Frequent cleaning and maintenance of catchbasin sumps will help to lessen the load of solids and other settleable material found in road runnoff.

The Ministry of the Environment suggests that accurate records of salt application be maintained. The type of deicing agent employed (eg. sodium chloride, calcium chloride, etc.), the rate of application, the frequency of application, and road areas covered should be recorded. These data would aid the Ministry in determination of total chloride loading to a basin from road salt application, as well as providing the municipal authority with quantitative data on the use of deicing materials. A suggested format for keeping records of the quantity of salt used on a daily basis is appended.

2. Deicing Salt - Storage

Road salt or sand/salt stockpiles should always be protected from precipitation or surface runoff. Further, the storage facility should be underlain with an impervious apron (preferably asphalt) and dyked to prevent the seepage of salt leachate from the storage area to a nearby watercourse or to ground water aquifers.

Permanent storage structures afford the best protection and we urge the installation of such structures wherever possible. Other methods of protection such as polyethylene sheets and spray coating have generally proven to be less effective, but are certainly a better alternative to open storage until permanent structures are installed.

With noise and general aesthetic conditions in mind, salt storage areas should be located away from residential zones.

Data Recording Form

Deicing Material Application Records													Year _____
Date	Type of Deicer Used	Location		Location		Location		Total Spread Today	Total Spread To-date	Precip. (in.)	Snow-fall to-date	Spread Factor	
		Daily	To-date	Daily	To-date	Daily	To-date						